

I claim:

1. A method of forming an article through adiabatic coalescence comprising the steps of:

- providing a mold;
- filling the mold with a material;
- placing a tool in the mold that extends from the mold;
- <sup>raw</sup> providing a striking unit; and,
- striking the tool with the striking unit with adequate force to adiabatically coalesce the material.

2. The method of claim 1 wherein the material is particulate.

3. The method of claim 2 wherein the particulate material is metallic.

4. The method of claim wherein the striking unit is an impact ram.

5. The method of claim 2 wherein the particulate material comprises a powder.

6. The method of claim 1 wherein the material is selected from the group consisting of metals, metal alloys, ceramics, polymers and woods.

7. The method of claim 1 wherein the step of filling the mold with a material comprises the steps of partially filling the mold with a material, adding at least one core to the mold and adding additional material to the mold to fill the mold.

8. The method of claim 7 including the additional step of removing the core from the mold after striking the tool with

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the striking unit with adequate force to adiabatically coalesce the material.

9. The method of claim 1 wherein the material comprises one or more different materials.

10. The method of claim 1 wherein the step of filling the mold with a material comprises the steps of filling a first portion of the mold with a first material and filling a second portion of the mold with second material.

11. The method of claim 1 including the additional step of either pre-compacting or preheating the material before striking the mold or material.

12. The method of claim 1 wherein the step of striking the tool with the striking unit with adequate force to adiabatically coalesce the material comprises the step of striking the tool with a first primary impact and plurality of secondary impacts of decreasing force.

13. The method of claim 12 wherein the primary impact generates at least one wave in the material and wherein the timing of the secondary impacts is based on the location of said wave.

14. The method of claim 12 wherein the total energy imparted by said primary impact and said secondary impacts is equal to a predetermined amount.

15. The method of claim 13 wherein the timing of the secondary impacts is selected to generate secondary waves having peaks that correspond to the peaks of the wave

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generated by the primary impact.

16. The method of claim 1 including the additional step of applying a force to the material to remove it from the mold after the material has been adiabatically coalesced.

11 ✓ 17. The method of claim 1, including the additional steps of heat treating the adiabatically coalesced material, returning the adiabatically coalesced material to the mold, and striking the tool with the striking unit.

18. A method of forming an article through adiabatic coalescence comprising the steps of:

providing a mold;

filling the mold with a material; and, 07P

providing a striking unit;

striking the mold or the material with the striking unit with adequate force to adiabatically coalesce the material.

19. A percussion machine with a striking unit for emitting kinetic energy of such magnitude to cause adiabatic coalescence in a material, said striking unit comprising a first impact ram movable between two end positions and having two circumferential surfaces perpendicular to the axis of the impact ram, which surfaces can be influenced by liquid pressure and are of different sizes, the large surface, when under pressure bringing the first impact ram to its original position for a stroke.

20. The percussion machine of claim 19 including a second impact ram opposed to said first impact ram.

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21. The percussion machine of claim 19 further including a power source selected from the group consisting of hydraulics, electricity, electromagnetism and pneumatics.

22. The percussion machine of claim 19 wherein said impact ram moves at a controllable speed and wherein said speed is over 2 m/s.

23. The percussion machine of claim 19 wherein said impact ram is adjustable to deliver a predetermined amount of energy to an object struck by said impact ram.

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